

# THE WEATHER AND CIRCULATION OF NOVEMBER 1969

## A Circulation Reversal With Warming in the West

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### 1. MEAN CIRCULATION

The average 700-mb circulation of November was markedly reversed from that of October (Stark 1969). Unusually strong troughs replaced ridges over the eastern United States and Europe while ridges replaced the cyclonic circulation of October over the western Atlantic and central Asia. Blocking decreased from October to November in North America and Europe, but increased in the Atlantic. By far, the most anomalous circulation features of the hemisphere were in the Atlantic and Europe this November (figs. 1 and 2). In the huge Atlantic ridge, 700-mb heights were as much as 170 m above normal and sea-level pressures 16 mb higher than normal. Negative departures in the trough downstream were 160 m at 700 mb and 18 mb at sea level.

Height changes between the 2 mo were extremely large in the Atlantic; maximum values of height rise were 230 m south of Greenland and of falls were 220 m over southern Scandinavia (fig. 3). Between these change centers, the marked increase of northerly flow affected Great Britain's weather considerably. Cooling began there early in November after a mild October and continued in progressively stronger outbreaks, culminating in occasional severe gales over the North Sea and snow in many areas of Great Britain in late November. Maximum height rises were 170 m in western Siberia where the deep trough of October was replaced by a broad ridge. Over western Canada falls of 130 m in which had been a blocking ridge led to amalgamation of the characteristic "split" westerlies into a single band with principal axis not far from normal. As the blocking relaxed in Canada and the mean trough over the conterminous United States shifted eastward, the westerlies were carried well south of normal across the Atlantic coast. Similar behavior of the westerlies occurred over Europe, but in between, as blocking became more pronounced in the western Atlantic, the principal axis was diverted well north of normal (fig. 4).

In the Pacific, a zone of height rises extended from the China coast to Oregon, indicating a speedup of the westerlies at middle to high latitudes and of the easterlies in the subtropics. In the tropical Pacific there were two storms that matured to typhoon intensity east of the Philippines very early in November. Both recurved into the westerlies south of Japan.

### 2. MONTHLY WEATHER

Strong anomalous warming from October to November

over the northwestern two-thirds of the country led to higher than normal November temperatures in that area as well as the Northeast (fig. 5). Monthly temperature anomalies in parts of Montana rose 15°F, which is approximately the normal temperature decline there this time of year. The average temperature at Great Falls, Mont., was 2°F higher in November than in October, where normally it would be 13°F lower. Within the standard network of 100 cities, 63 were warmer by one or more anomaly classes and 25, mostly in the Southeast, were cooler by a class or more.

Warming was the reaction to be expected from falling 700-mb heights in the Yukon and eastward progress of a trough in the United States. Also to be expected was cooling in the Southeast where the trough replaced the ridge of October. During this changeable November, no monthly temperature records were established.

With the mean trough farther east, it was drier in November over much of the country. Less than an inch of precipitation was measured in the West, except along the Pacific coast and spotted areas elsewhere (fig. 6). This was the driest November of record (0.03 in.) at Des Moines, Iowa, and the second driest at Waterloo, Iowa. The wettest areas were the South Atlantic coast and New England, where Boston, Mass., reported the wettest November since 1878. During a long wet spell the first half of the month, rainfall was reported each day for 14 days at Portland, Maine, and 13 days at Providence, R.I. New records for consecutive days of rain were established at Concord, N.H. (14), and Boston, Mass. (12). In New York State, this was the first month since June 1969 at Rochester with more than normal precipitation; at Buffalo, only the second November since 1871 that precipitation fell on 28 days; and at Albany, the third wettest November of record. Although amounts in the Southwest were relatively small, it was wetter than normal in the southern parts of four States from California to Texas. Yuma, Ariz., had the wettest November since 1905. This precipitation was produced by a trough segment that became cut off from the principal trough.

A noteworthy weather event was the extremely deep storm of November 3-6 off the coast of Washington and Oregon. Sea-level pressure in the storm fell to 944 mb, winds were 50 kt or more in all quadrants, and swell heights of 59 ft were reported. Although breakers along the coast were estimated 35 to 40 ft high, wave damage was considered minimal because the astronomical tide was low during this period.

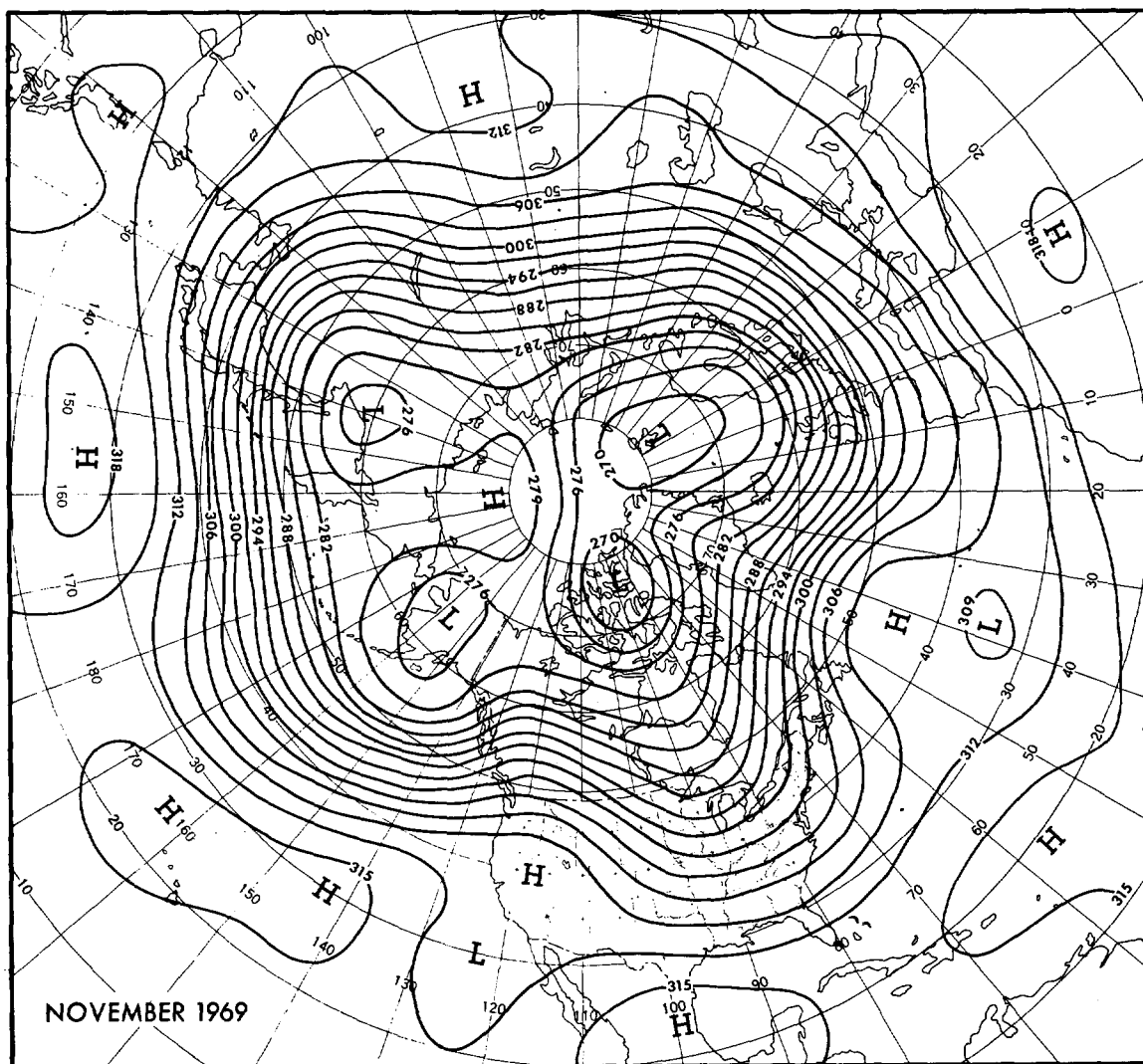


FIGURE 1.—Mean 700-mb contours (decameters) for November 1969.

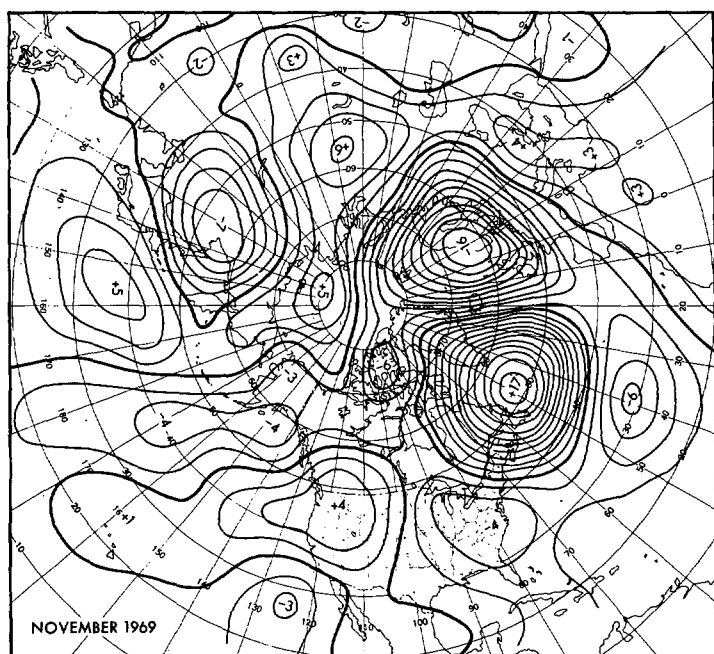


FIGURE 2.—Departure from normal of mean 700-mb height (decameters) for November 1969.

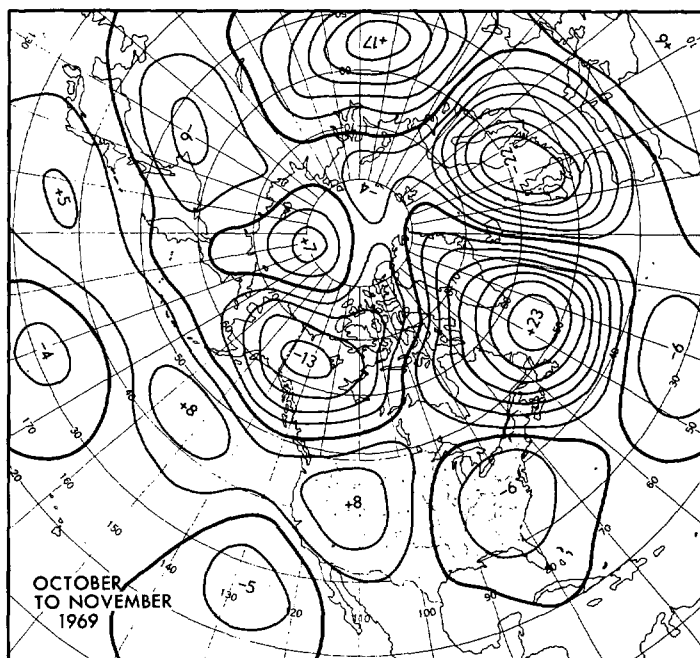


FIGURE 3.—Change of 700-mb height anomaly (decameters) from October to November 1969.

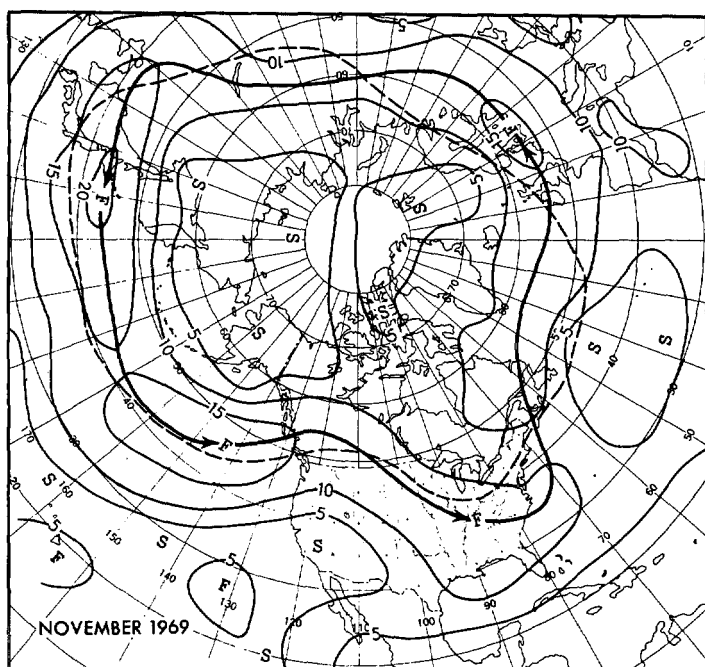


FIGURE 4.—Mean 700-mb isotach (meters per second) for November. Solid arrows indicate axis of maximum wind speed, dashed line the normal.

### 3. WEEKLY CIRCULATION AND WEATHER

On November 1, a strong trough dominated the circulation aloft, and cool temperatures prevailed from the Rockies to the Appalachians. Precipitation was extensive along the east slopes of the Rockies and from the Mississippi Valley eastward. A storm along the Atlantic coast deposited 5.43 in. of rain, more than three times the normal for November, in 24 hr ending at 7 a.m. on the 1st at Jacksonville, Fla. That evening more than 7 in. fell at Myrtle Beach, S.C., in 6 hr.

During the week of November 3–9 (fig. 7), progress of the major trough was slowed along the Atlantic coast by the development of a blocking ridge in the western Atlantic. Temperatures were lower immediately behind the trough in the Southeast, but warming was widespread farther west. Precipitation decreased in the Southeast and increased in the Northeast as the coastal storm weakened and decelerated, blocked by the growing ridge. West of the Rockies, precipitation increased with the approach of a deep trough from the Pacific.

The following week (fig. 8), the southern part of this trough became cut off near southern California, while the northern part intensified and sped eastward. Behind the trough as Arctic air poured southeastward to the Gulf and Atlantic Coasts, record daily minimum temperatures were reported on the 14th and 15th in Texas, Tennessee, Kentucky, and the Carolinas. Several of these were record lows for so early in the season. Precipitation decreased in the West except that showers continued in Arizona and New Mexico.

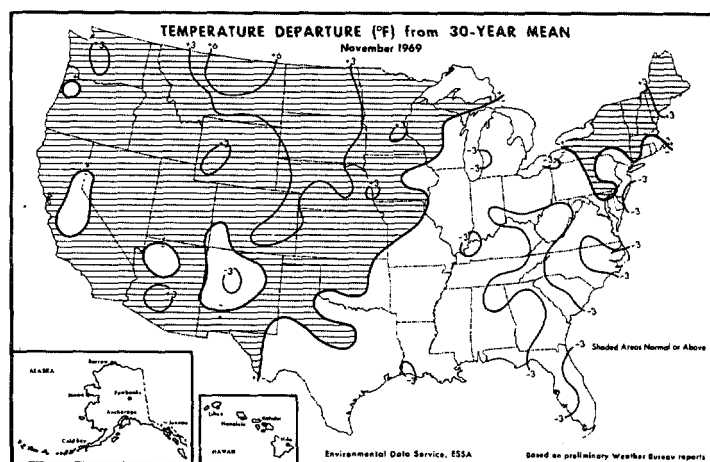


FIGURE 5.—Departure from normal of average surface temperature (°F) for November 1969 (from Environmental Data Service 1969).

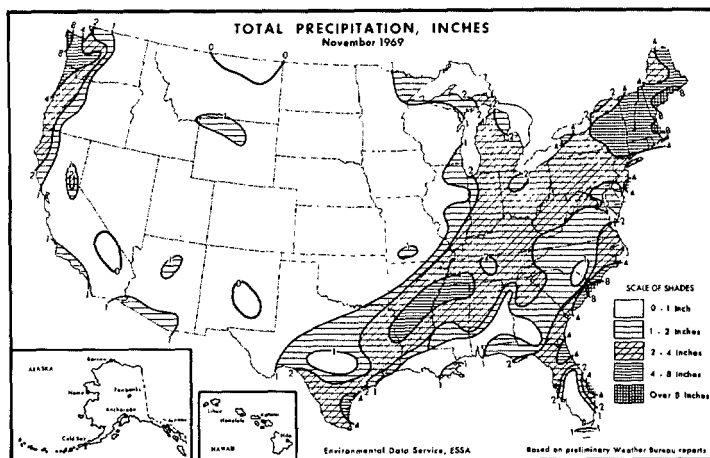


FIGURE 6.—Total precipitation (inches) for November 1969 (from Environmental Data Service 1969).

Late in the week, a new short-wave trough from the Pacific picked up the Southwest Low as it entered the country. The front with the new trough was extremely strong. Early in the week of November 17–23 (fig. 9), temperatures 100 mi apart differed by more than 30°F across the front in Kansas, and falls of 10°–15°F were reported as it passed. Further cooling occurred over most of the northwestern two-thirds of the country, but warming took place in the Southeast where the front arrived late in the week. Heavy precipitation fell from Texas to the Great Lakes in the southerly flow of moist Gulf air ahead of the trough. In the Southwest, the warm showery regime ended as a huge cold Pacific High came inland behind the trough.

Sea-level pressures were the highest of November record at Fresno, Calif., and Phoenix, Ariz., on the 18th as the High migrated into the Great Basin. This also marked the beginning of a Santa Ana wind condition which

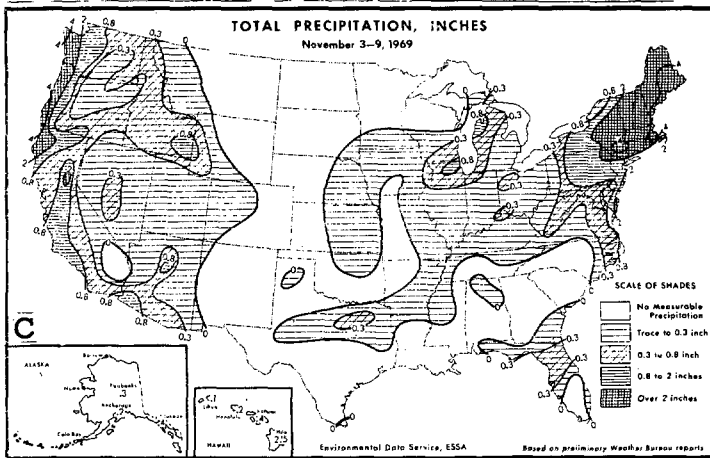
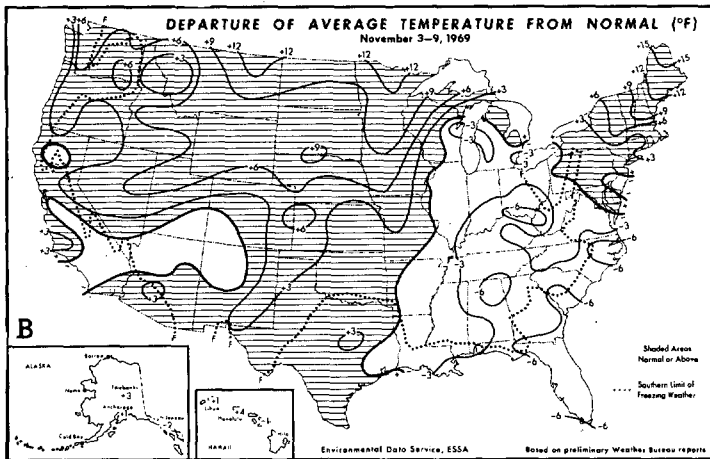
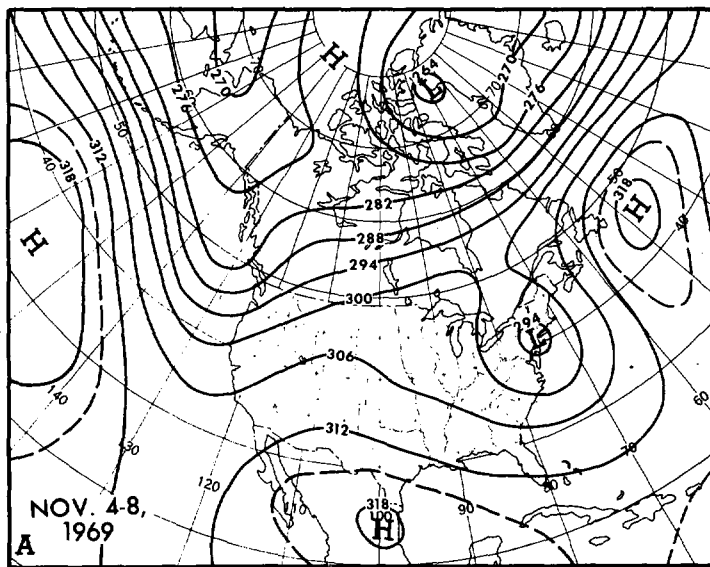


FIGURE 7.—(A) mean 700-mb contours (decimeters) for Nov. 4-8, 1969; (B) departure from normal of average surface temperature (°F) for Nov. 3-9, 1969 (from Environmental Data Service 1969); (C) total precipitation (inches) for Nov. 3-9, 1969 (from Environmental Data Service 1969).

lasted from the 18th through the 29th. During this period, average relative humidities at Los Angeles City Office were the lowest since January 1960, and winds were as high as  $78 \text{ mi hr}^{-1}$  in mountain passes.

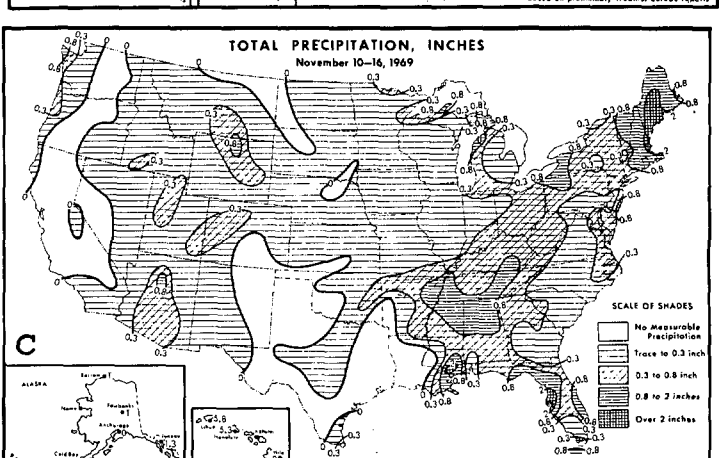
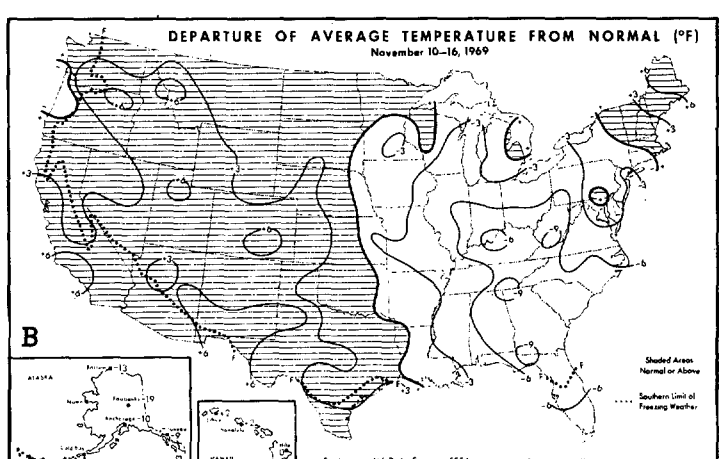
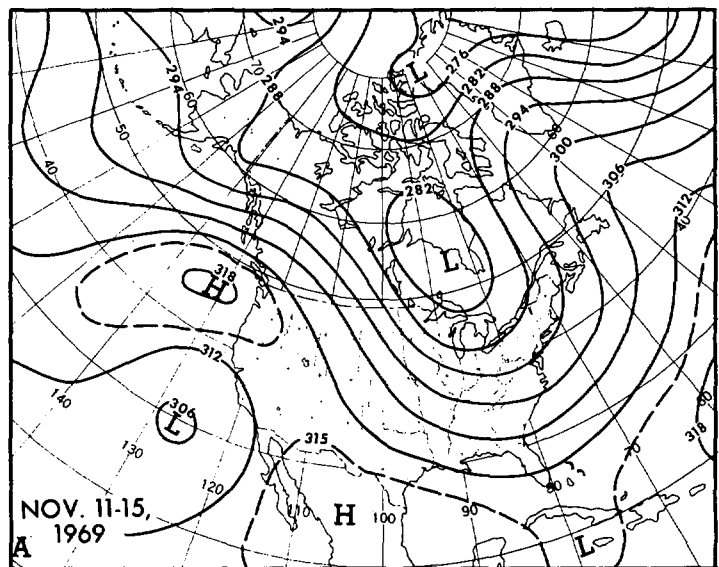


FIGURE 8.—Same as figure 7 except (A) for Nov. 11-15, 1969; (B) and (C) for Nov. 10-16, 1969

Persistence of the Santa Ana winds indicates that high pressures prevailed over the Great Basin until the end of the month. However, the Highs that continued to migrate across the West traveled paths that were successively farther north. Simultaneously, there was a northward shift of valley fog conditions that are more typical of the

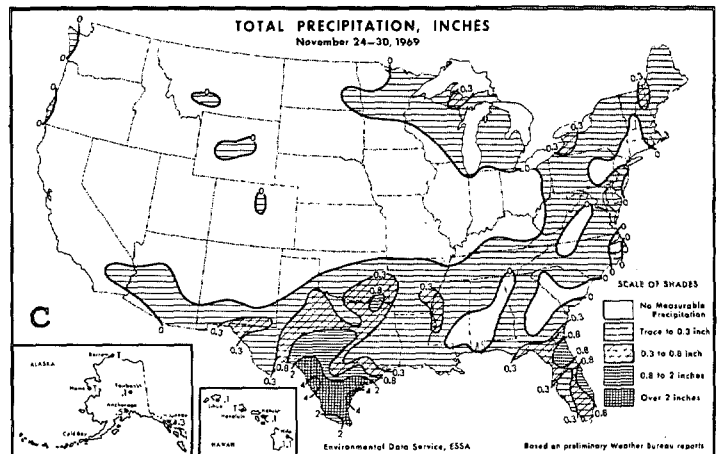
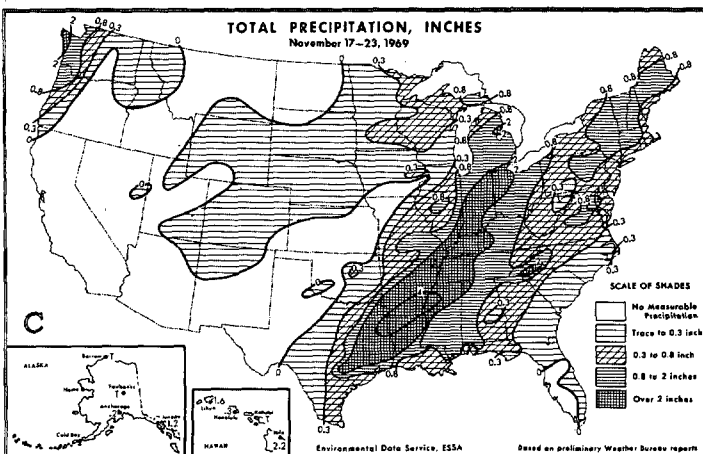
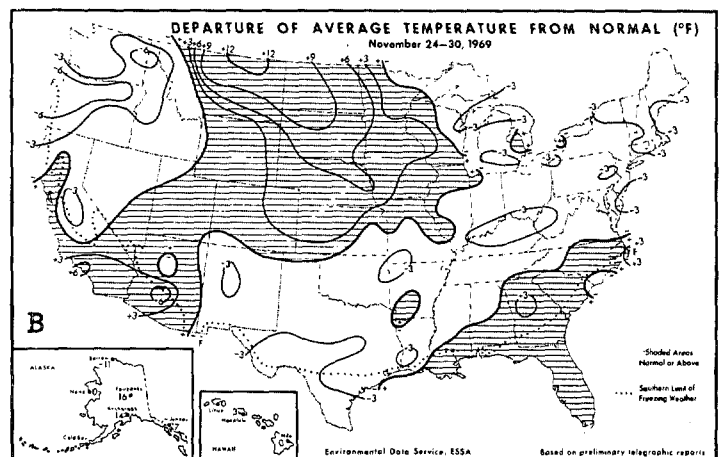
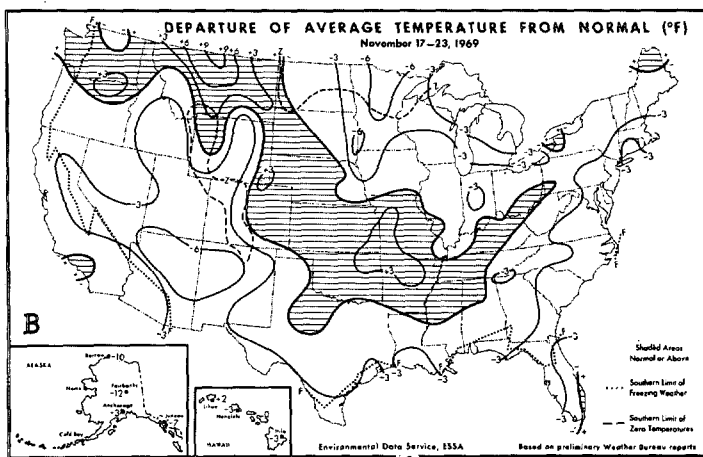
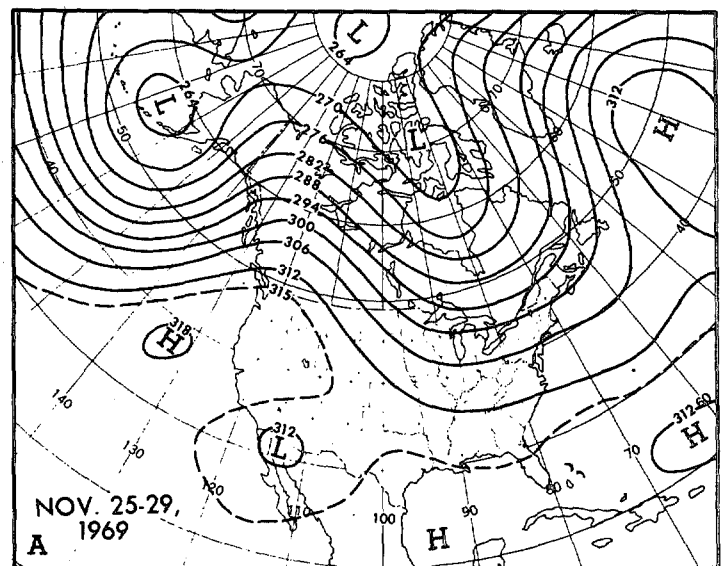
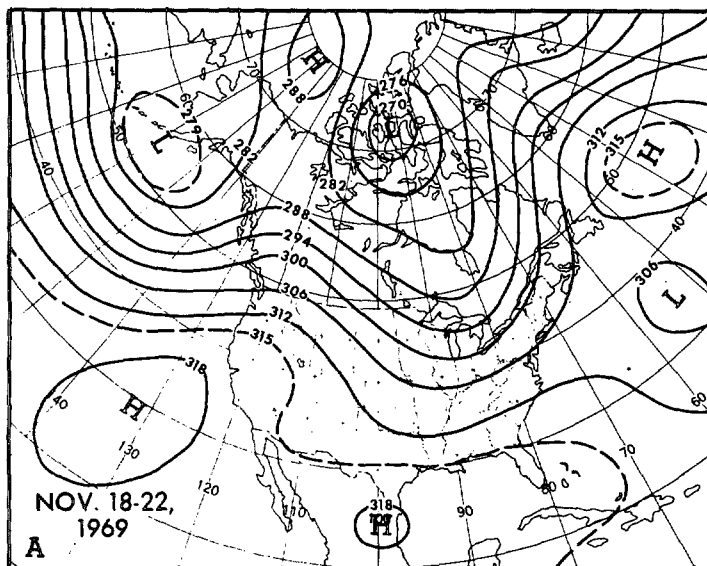


FIGURE 9.—Same as figure 7 except (A) for Nov. 18-22, 1969; (B) and (C) for Nov. 17-23, 1969.

FIGURE 10.—Same as figure 7 except (A) for Nov. 25-29, 1969; (B) and (C) for Nov. 24-30, 1969.

great valley of California to Washington, Oregon, and Idaho. This accounts to some extent for cooler temperatures in the Pacific Northwest the final week (fig. 10) despite an increase in 700-mb heights. Otherwise, the weather regime that was established the third week changed little through the remainder of the month.

#### REFERENCES

- Environmental Data Service, ESSA, *Weekly Weather and Crop Bulletin*, Vol. 56, Nos. 45-49, Nov. 10, 17, 24, and Dec. 1, 8, 1969.  
Stark, L. Paul, "The Weather and Circulation of October 1969—Widespread Cold With High-Latitude Blocking Over North America," *Monthly Weather Review*, Vol. 98, No. 1, Jan. 1970, pp. 85-90.